AN AJSS An Asian Journal of Soil Science
Volume 11 | Issue 1 | June, 2016 | 115-119 | e ISSN–0976–7231 ■ Visit us : www.researchjournal.co.in

Research Article

DOI : 10.15740/HAS/AJSS/11.1/115-119

Influence of amino acid formulation on okra and brinjal

■ S. PRAVEENA KATHARINE, G. MARIAPPAN, K. RADHIKA AND S. HEMALATHA

Received : 01.02.2016; Revised : 03.04.2016; Accepted : 29.04.2016

MEMBERS OF RESEARCH FORUM:

Corresponding author :
S. PRAVEENA KATHARINE,
Department of Soil Science and Agriculture Chemistry, Tamil Nadu Agricultural University,
COIMBATORE (T.N.) INDIA
Email: praveenakate@rediffmail.com

Co-authors :
G. MARIAPPAN, K. RADHIKA AND S. HEMALATHA, Department of Soil Science and Agriculture Chemistry, Tamil Nadu Agricultural University,
COIMBATORE (T.N.) INDIA

Summary

Amino acids form the building blocks of protein, the basic component of every living cell and are well known to increase the yield and overall quality of crops. In this context, the product amino acid formulation with 10 per cent free amino acids manufactured by Trade Corporation International, Spain and supplied by M/s. Mahamaya Life Sciences Ltd., New Delhi was evaluated to study its influence on growth, yield, quality parameters and uptake of nutrients by the crops, okra and brinjal. The field experiment on okra was conducted at farmer's field at Poosaripalayam, Coimbatore and that with brinjal was conducted in farmer's field at Urmandampalayam, Coimbatore. Amino acid formulation with 10 per cent free amino acid was tried at two doses, @ 2.0 l ha^{-1} x 4 sprays at flowering and @ 4.0 l ha^{-1} x 2 sprays at flowering. In okra, the treatment T_1, amino acid formulation at 2.0 l ha^{-1} (4 times spray) recorded the maximum pod yield of 12.9 t ha^{-1} and registered an increase of 24.8 per cent over control. In brinjal, the treatment T_2, amino acid formulation at 4.0 l ha^{-1} (2 times spray) recorded the maximum fruit yield of 47.4 t ha^{-1} and registered an increase of 19.7 per cent over control. The available NPK status of post harvest soil was lower in the treatments with amino acid formulation due to enhanced crop removal.

Key words : Amino acids, okra, brinjal, yield, quality parameters

How to cite this article : Katharine, S. Praveena, Mariappan, G., Radhika, K. and Hemalatha, S. (2016). Influence of amino acid formulation on okra and brinjal . *Asian J. Soil Sci.*, **11** (1) : 115-119 : **DOI : 10.15740/HAS/AJSS/11.1/115-119.**

Introduction

Sufficient food energy is only the first goal, and sufficient nutritious food the final one. Assured access to nutritionally adequate and safe food is essential for individual welfare and for national, social and economic development. About 800 million people in developing countries (20% of the population) are undernourished. The term malnutrition refers mainly to suboptimal food energy intake, the required daily supply being 2600–3000 kcal (Roy *et al*., 2006). However, malnutrition in a complete sense also includes shortages of protein (essential amino acids), vitamins and essential mineral nutrients (e.g. phosphate and micronutrients). In developing countries, protein deficiency (less than 50 g/day for an adult weighing 60 kg or shortages of some essential amino acids such as lysine) and a deficiency in vitamin A and iron (Fe) are common (Roy *et al*., 2006). In order to prevent diseases resulting from nutritional deficiencies, the production of high-quality food is essential.

Amino acids are well known bio-stimulants with positive effects on plant growth and plant yield.

Application of amino acids has proved to increase the yield and enhance the quality of alfalfa (Mahmood Pooryousef and Khoshnood Alizadeh, 2014), radish (Shehata *et al*., 2011), strawberry (Abo Sedera *et al*., 2010) and sweet pepper (Al-Said and Kamal, 2008). Amino acids are the basic ingredients for the process of protein synthesis and are widely used for the biosynthesis of non-protein nitrogenous materials in plants (Shehata *et al*., 2011). Amino acids could significantly mitigate the injuries caused by abiotic stresses (Kowalczyk and Zielony, 2008).

The present consumption of vegetables per capita per day in India is 152 g against the recommended daily consumption of 300 g by the national nutrition guidelines (Sachdeva *et al*., 2013). It indicates the necessity to raise the production of vegetables which can be achieved by bringing more land under vegetables cultivation and increasing the productivity of the vegetables as well. Brinjal is a low calorie vegetable and has healthy nutrition profile. Its anti-oxidants have potential health effects against cancer, ageing, inflammation and neurological diseases (*www.nutrition and you.com*). Okra is a low calorie vegetable and a rich source of dietary fibre, minerals and vitamins recommended by nutritionists in cholesterol controlling and weight reduction programmes besides being an excellent source of anti-oxidant vitamin (*www.nutrition and you.com*). Considering the importance of these crops in our daily diet, this research work was contemplated to explore the influence of growth stimulant and yield enhancer amino acid formulation manufactured by Trade Corporation International, Spain and supplied by M/s. Mahamaya Life Sciences Ltd., on okra and brinjal which could lead to a breakthrough in their production.

Resource and Research Methods

Field experiment on okra was conducted at farmer's field at Poosaripalayam, Coimbatore and that on brinjal was conducted in farmer's field at Urmandampalayam, Coimbatore to evaluate the effects of amino acid formulation (10 % free amino acids) manufactured by Trade Corporation International, Spain and supplied by M/s. Mahamaya Life Sciences Ltd., New Delhi on okra and brinjal.

Experimental site and soil description :

The field experiment on okra was conducted at farmer's field at Poosaripalayam, Coimbatore. The farm is located in the Western agro climatic zone of Tamil Nadu at 11°12' North latitude and 77° 03' East longitude at an altitude of 426.74 m above MSL. The soil was sandy loam in texture and neutral in soil reaction. The available N, P, K status of the soil was low, medium and high, respectively. The cation exchange capacity of the experimental soil was 15.5 c mol (P^+) kg^{-1}. The organic carbon content of the soil was 0.62 per cent. The soil had an E.C. of 0.240 dS m^{-1}. The experiments on brinjal were conducted on farmer's fields at Urumandampalayam, where the available N, P and K status of the soil was low, high and high, respectively. The soil of the experimental field was sandy clay loam in texture and neutral in soil reaction. The cation exchange capacity of the experimental soil was 19.6 c mol (P^+) kg^{-1}. The organic carbon content of the soil was 0.30 per cent. The soil had an EC of 0.810 dS m^{-1}.

Treatment details :

All the treatments were imposed during flowering stage at an interval of 15 days. As per the treatment schedule, the growth stimulant was mixed with required quantity of water and applied as foliar spray using a Knapsack sprayer. Plant samples were collected at flowering and harvest stages and analysed for their N, P, K content and uptake. Data on the plant height, number of branches per plant, number of fruits per plant were observed during the harvest stage. The okra pods and brinjal fruits were examined for characters such as length, girth, and individual fruit/ pod weight. The fruits collected were analysed for their N, P, K content and uptake and quality parameters such as total sugars, reducing and non reducing sugars, total soluble solids, ascorbic acid content and phenols. Post harvest soil samples were analysed for their nutrient status.

Table A : The treatments imposed on test crops are as given below

Crop	Treatments
Brinjal (Local) Okra (Parbanikranti)	T_1 – Amino acid formulation 10% @ 2.0 l ha^{-1} x 4 sprays at flowering (15 days interval) T_2 – Amino acid formulation 10% @ 4.0 l ha^{-1} x 2 sprays at flowering (15 days interval) T_3 – Control – water spray alone

The quality parameters of okra and brinjal fruits were analysed following the standard procedures. The ascorbic acid content was estimated following the procedure of (Sadasivam and Theymoli , 1987), the total soluble solids using a 'Zeiss' hand refractometer and expressed as (°B)

Brix after deducting the correction factor (Porter, 1960). The total sugars (Hedge and Hofreiter, 1962), Reducing sugars (Somogyi, 1952) and non- reducing sugars (difference between total sugars and the reducing sugars), amino acid content of grain, and fruit samples (Theymoli and Sadasivam, 1987) and phenols (Folin-ciocalteu calorimetreic method) were also estimated to study the effect of amino acids on the quality parameters of the crops. The data collected from the field experiments and laboratory estimations were subjected to statistical analysis as per the procedures recommended by Panse and Sukhatme (1978).

Research Findings and Discussion

Genetic potential is not being fully achieved with cultural practices only. It has been established that the yields can be increased to a considerable extent with the use of bioregulators as physiological managers. This is possible because biomass gain in crop plants is controlled by complex interactions of photosynthate production by source leaves and photosynthate utilization by sink tissues. Bioregulators can influence the gene and enzyme interactions.

In the present study, plants treated with amino acid formulation 10 per cent at 2.0 l ha^{-1} showed improved

Table 1 : Effect of amino acid formulation on yield and quality parameters of okra

Tr. No.	Treatments	Fruits $plant^{-1}$	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Yield ha^{-1} (t)	% yield increase
T_1	Amino acid formulation 10 % (2.0 l ha^{-1}x 4 times)	17.0	10.4	3.67	20.7	12.9	24.8
T_2	Amino acid formulation 10 % (4.0 l ha^{-1}x 2 times)	14.3	10.2	3.18	18.4	11.3	16.8
T_3	Control	11.7	9.97	2.50	15.4	7.82	
	S.E.±	0.96	0.22	0.22	0.98	0.96	
	C.D. (P= 0.05)	2.09	0.48	0.47	2.14		
		Protein (%)	CHO (%)	Crude fibre (%)	Ascorbic acid (mg $100g^{-1}$)	Total phenols (mg $100g^{-1}$)	Amino acids (g $100g^{-1}$)
T_1	Amino acid formulation 10 % (2.0 l ha^{-1}x 4 times)	20.6	32.0	12.1	12.3	26.2	0.765
T_2	Amino acid formulation 10 % (4.0 l ha^{-1}x 2 times)	18.9	31.6	14.3	13.5	21.4	0.746
T_3	Control	17.1	29.9	16.6	15.7	30.5	0.717
	S.E. ±	0.67	0.43	0.86	0.66	1.75	0.011
	C.D. (P= 0.05)	1.47	0.93	1.88	1.44	3.81	0.020

Table 2 : Effect of amino acid formulation on yield and quality parameters of brinjal

Tr. No.	Treatments	Yield ha^{-1} (t)	% increase over control	Ascorbic acid (mg 100 g^{-1})	Amino acid (g 100 g^{-1})	Protein (%)
T_1	Amino acid formulation 10 % (2.0 l ha^{-1}x 4 times)	45.2	14.2	11.5	0.599	16.3
T_2	Amino acid formulation 10 % (4.0 l ha^{-1}x 2 times)	47.4	19.7	9.62	0.566	15.0
T_3	Control	39.6		9.04	0.523	11.9
	S.E.±	1.34		0.26	0.015	00.7
	C.D. (P= 0.05)	2.92		0.57	0.033	01.6
		TSS (°brix)	Total sugars (%)	Reducing sugars (%)	Non reducing sugars (%)	Total phenols (mg $100g^{-1}$)
T_1	Amino acid formulation 10 % (2.0 l ha^{-1}x 4 times)	5.39	4.44	2.78	1.65	55.6
T_2	Amino acid formulation 10 % (4.0 l ha^{-1}x 2 times)	4.79	4.86	2.89	1.97	53.8
T_3	Control	3.82	3.99	2.14	1.85	67.4
	S.E. ±	2.45	0.14	0.13	0.53	2.46
	C.D. (P= 0.05)	5.35	0.31	0.29	0.12	5.35

growth characteristics. The increase in growth parameters could naturally increase the rate of photosynthesis. Increased rate of assimilation of nutrient from soil through improvements in the root growth characteristics coupled with enhanced rate of photosynthesis have reflected in increased yield and quality of the economic produce.

Effect of amino acid formulation on okra :

The important yield attributes of the vegetable, okra were number of fruits plant^{-1}, fruit weight plant^{-1}, fruit length and diameters. The highest number of fruits per plant (17.0), fruit length (10.4 cm), diameter (3.67 cm) and weight (20.7 g) were observed in the treatment of amino acid formulation at 2.0 l ha^{-1} (4 times spray). The treatment T_1 registered an yield increase of 24.8 per cent and T_2, 16.8 per cent over control (Table 1).

Effect of amino acid formulation on macronutrient content and quality parameters of fruits :

Okra fruits in the plants treated with amino acid formulation at 2.0 l ha^{-1} (4 times spray) recorded the highest N content (2.96 %), P content (0.576%), K content (2.70%) followed by 2 times spray of amino acid formulation at 4.0 l ha^{-1}. But the two treatments did not have any significant difference between them. The amino acid application has a marked influence on the quality parameters of fruits. Crude protein content in fruits was significantly high (20.6 %) in the treatment with four split application of amino acid formulation at 2.0 l ha^{-1} followed by two split application at 4.0 l ha^{-1}. Similarly, the highest carbohydrate (32.0 %), minimum crude fibre content (12.1%), minimum ascorbic acid content (12.3 mg per 100g) and maximum amino acid content (0.765 g 100g^{-1}) were recorded with the treatment of amino acid formulation at 2.0 l ha^{-1} (4 times spray) (Table 1).

Effect of amino acid formulation on brinjal :

The fruit yield per plot due to various treatments was recorded and yield per hectare computed. The data revealed the superiority of the treatment T_2, amino acid formulation at 4.0 l ha^{-1} (2 times spray) which recorded the maximum fruit yield of 47.4 t ha^{-1}. However, it was at par with four times spray of the product at 2.0 l ha^{-1}.

The fruit characters such as fruit weight, fruit length, stalk length and fruit girth revealed the superiority of increased split application of amino acid formulation. Maximum fruit weight (250 g), fruit length (9.18 cm) and fruit girth (13.1 cm) were observed in the amino acid formulation at 2.0 l ha^{-1} (4 times spray) (T_1) followed by the treatment T_2. However, the treatments T_1 and T_2 had at par effect with regard to fruit length. The lowest fruit weight, fruit length and fruit girth was observed in control.

Effect of amino acid formulation on macronutrient content and quality parameters of fruits :

Plant treated with amino acid formulation recorded significant increase in N, P and K content in fruits. The highest N content (2.60 %) and K content (3.58 %) in fruits were observed in 4 times spray of amino acid formulation at 2.0 l ha^{-1} whereas highest P content (0.592%) was observed in 2 times spray of amino acid formulation at 4.0 l ha^{-1}.

The maximum sugar content-total sugars (4.86 %), reducing (2.89 %) and non-reducing sugars (1.97 %) was recorded in T_2 and highest TSS content (5.39 %) was observed in the treatment with two times spray of amino acid formulation at 4.0 l ha^{-1} (T_1) (Table 2). Control recorded the lowest sugar content of fruits. The amino acid application has a marked influence on the protein content of fruits. Maximum crude protein content (16.3 %) and highest value for the amino acids (0.599 g 100 g^{-1}) were recorded in the treatment T_1, four times spray of the formulation at 2.0 l ha^{-1} in fruits. Similarly, ascorbic acid content of fruits increased with increased split application of amino acid formulation and recorded maximum ascorbic acid content (11.5 mg per 100 g) for 4 split application of the formulation at 2.0 l ha^{-1}. Control (T_3) recorded highest total phenolics content (67.4 mg per 100 g).

The post harvest soil fertility status under both the crops revealed a declining trend in N, P, K levels with the application of the amino acid formulation due to increased rate of assimilation of nutrients from soil which has reflected in increased yield and quality of the economic produce.

Literature Cited

Abo Sedera, F., Amany, A., Abd El-Latif, L.A., Bader, A. and Rezk, S.M. (2010). Effect of NPK against *Meloidogyne incognita* on soybeans. *J. Agric. Sci. Mansoura Univ.*, **30** : 1097-1103.

Al-Said, M.A. and Kamal, A. M. (2008). Effect of foliar spray with folic acid and some amino acids on flowering, yield and quality of sweet pepper. *J. Agric. Sci. Mansoura Univ.*, **33** :

7403-7412.

Hedge, J.E. and Hofreiter, B.T. (1962). Determination of reducing sugar and CH_2O. In: *Carbohydrate chemistry* 17 (Eds. Whistler, R.L. and Be Miller, JN) Academic Press, NEW YORK, U.S.A.

Kowalczyk, K. and Zielony, T. (2008). Effect of aminoplant and Asahi on yield and quality of lettuce grown on rock wool. In: *Conference of Bio-stimulators on Modern Agriculture*, 7-8 February.

Mahmood Pooryousef and Khoshnood Alizadeh (2014). Effect of foliar application of free amino acids on alfalfa performance under rainfed conditions. *Res. Crops*, **15**(1): 254-258.

Panse, V.G. and Sukhatme, P.V. (1978). *Statistical methods for agricultural workers*. ICAR, NEW DELHI, INDIA.

Porter, D.R. (1960). Quality criteria and their evaluation in a breeding programme for processing type tomatoes. *Proc. Plant Soil Seminar,* Cambell Soup 10, CALIFORNIA.

Roy, R.N., Finck, A., Blair, G.J. and Tandon, H.L.S. (2006). Plant nutrition for food security. A guide for integrated nutrient management. Fertilizer and plant nutrition bulletin. Food and agriculture organization of the United Nations, Rome. 5-19pp.

Sachdeva, Sandeep, Sachdev, Tilak R. and Sachdeva, Ruchi (2013). Increasing fruit and vegetable consumption: challenges and oppurtunities. *Indian J.Comm. Med.,* **38** (4) : 192-197.

Sadasivam, S. and Theymoli, Balasubramanian (1987). In : *Practical manual in biochemistry*, Tamil Nadu Agricultural University, Coimbatore (T.N.) INDIA.

Shehata, S.M., Heba, S., Abdel-Azem, A., Abou El-Yazied, A. and El-Gizawy, M. (2011). Effect of foliar spraying with amino acids and seaweed extract on growth chemical constitutes, yield and its quality of celeriac plant. *European J. Sci. Res.*, **58** : 257-265.

Somogyi, M. (1952). Determination of reducing sugars by Nelson – Somogyi method. *J. Biol. Chem*., 200 -245.

Theymoli, Balasubramanian and Sadasivam, S. (1987). Estimation of total free amino acids. *Plant Foods Hum. Nutr.*, **37**: 41.

Webliography

www. nutrition and you. com.